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FORM PTO-1390 (Modified) (REV 10-95) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: **DN1996221USA**

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5): 09/297589

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/US96/19055	**27/11/96**	

TITLE OF INVENTION

AIRCRAFT TIRE WITH IMPROVED HIGH SPEED PROPERTIES

APPLICANT(S) FOR DO/EO/US

John Joseph Slivka, Thomas William Cooper, Hal Warren Stilley, Jr., Oscar Allen Hash and Jerome Wesley Ward

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
    A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☒ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☐ Certificate of Mailing by Express Mail
19. ☐ Other items or information:

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
	PCT/US96/19055	DN1996221USA

20. The following fees are submitted:.

	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :		
☐ Search Report has been prepared by the EPO or JPO **$930.00**		
☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) **$720.00**		
☐ No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) **$790.00**		
☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO **$1,070.00**		
☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) **$98.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	**$1,070.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	11 - 20 =	0	x $22.00	**$0.00**	
Independent claims	3 - 3 =	0	x $82.00	**$0.00**	
Multiple Dependent Claims **(check if applicable).**			☐	**$0.00**	
TOTAL OF ABOVE CALCULATIONS			=	**$1,070.00**	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable).**			☐	**$0.00**	
SUBTOTAL			=	**$1,070.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).			+	**$0.00**	
TOTAL NATIONAL FEE			=	**$1,070.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).**			☐	**$0.00**	
TOTAL FEES ENCLOSED			=	**$1,070.00**	
				Amount to be: refunded	$
				charged	$

☐ A check in the amount of to cover the above fees is enclosed.

☒ Please charge my Deposit Account No. **07-1725** in the amount of **$1,070.00** to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **07-1725** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

David E. Wheeler
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29,726
REGISTRATION NUMBER

05/03/99
DATE

IN THE EUROPEAN PATENT OFFICE

In re Application of:	)	Priority Date:
The Goodyear Tire & Rubber Company	)	27 November 1996
Int'l Application No:	)	Int'l Filing Date:
Inventor: John Joseph Slivka, et al.	)	27 November 1996
For: AIRCRAFT TIRE WITH IMPROVED HIGH SPEED PROPERTIES	)	IPC: EUROPEAN PATENT OFFICE PCT CHAPTER II
Docket No. DN1996221PCT	)	D-80298 MUNICH
Authorized Officer: A. Moris	)	Fax: (+49-89)2399-4465
Today's Date: September 22, 1998	)	

SENT VIA FACSIMILE

In Response to the Examination Report mailed 03 September 1998, the attached specification and claims are hereby submitted.

AMENDMENT

The substitute specification does not contain new matter, but has been rewritten to use consistent terminology throughout (Rule 10(2)PCT), and to place reference numerals in parenthesis as required (Rule 6.2(b)PCT), and to add background information on prior art (Rule 6.3(b)(i)PCT), as well as presenting claim 1 in a two-part format (Rule 6.3(b)(ii)PCT). The new pages are enclosed herewith.

Respectfully submitted,

By David E. Wheeler

David E Wheeler, Reg No 29,726

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cc; Mia Hecker-Schmidt, Lux

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AIRCRAFT TIRE WITH IMPROVED HIGH SPEED PROPERTIES

Technical Field

The invention relates to an aircraft tire with improved retreadability and improved high-speed properties.

Background Art

In the prior art, nylon is a preferred reinforcement material for aircraft tires because it is forgiving and is not as subject to fatigue as other available materials. Nylon reinforcement, however, does not have superior strength and many plies of nylon are needed in the construction of an aircraft tire.

It is known in the art to build aircraft tires using aramid reinforcement, but such tires, although they can be constructed using fewer plies and have better wear than a nylon reinforced tire, are generally considered to be harder to qualify at high speeds and are not used in high speed applications.

Prior art tires have been constructed using a nylon reinforced carcass and a folded aramid belt reinforcement in the crown area of the tire. Such tires wear well, but they are generally accepted for use only at speeds up to about 190 mph, although applicant on several occasions has run successful tests on the tires up to about 210 mph. Such tires, however, show a high level of rejection for first retreading since folded edges of the folded belt show large numbers of separations when the tread is removed. Economical use of aircraft tires is highly dependent on the number of times an aircraft tire can be retreaded.

JP-A-07 009814 teaches a high modulus belt reinforcement made of aramid cords which is wrapped around an outer belt having no folded edges.

FR-A-2 617 682 shows a belt reinforcement wrapped around an outer belt with no folded edges.

LU-A-44 682 shows an aircraft tire comprising at least a pair of parallel annular beads, at lest one carcass ply wrapped around said beads, a high modulus belt reinforcement with folded edges disposed over the carcass ply in the crown area of the tire, tread disposed over the belt reinforcement and sidewalls disposed between the tread and the beads.

It is an object of the present invention to provide a tire construction which shows good wear and retreadability yet has improved high speed potential. Other objects of the invention will be apparent from the following specification and claims.

Summary of the Invention

An aircraft tire of the invention has at least one pair of parallel annular beads, at least one

carcass ply wrapped around the beads, high modulus belt reinforcement disposed over the carcass ply in a crown area of the tire, tread disposed over the belt reinforcement, and sidewalls disposed between the tread and the beads, wherein the improvement comprises a layer of low modulus reinforcement material wrapped around the edges of the high modulus belt reinforcement. The high modulus belt reinforcement comprises high modulus reinforcement cords encapsulated in rubber to form a substantially two dimensional high modulus reinforcing material (18) having length and width, and the layer of low modulus reinforcement comprises low modulus reinforcement cords or filaments encapsulated in rubber to form a substantially two dimensional low modulus reinforcement material (19,19a,19b,19c) having length and width. The belt reinforcing package (23) in the illustrated embodiment comprises a high modulus reinforcing material (18) folded into a belt reinforcing package (23) wherein the high modulus reinforcing material (18) has a width about twice the width of the belt reinforcing package (23). In one embodiment of the invention, the low modulus reinforcing material (19) has substantially the same width as the high modulus reinforcing material (18) and is folded completely around the folded belt reinforcing package (23). In another embodiment, the low modulus reinforcing material (19a) has a width about five-eighths to seven-eighths of the width of the high modulus reinforcing material (18) and is placed radially inward of the folded belt, and the width edges of the low modulus reinforcing material (19a) are folded radially outward of the folded belt reinforcing package (23) over the folded belt edges. In another alternative embodiment, the low modulus reinforcing material (19b,19c) comprises split belt edge layers having a combined width of about five-eighths to seven-eighths of the width of the ply used to form the belt reinforcing package (23) wherein one edge of each split layer is disposed radially inward of the high modulus reinforcing material (18) and the distal end of each split layer is folded radially outward of the belt reinforcing package (23), substantially completely covering the radially outer surface of the belt reinforcing package (23).

In a specific illustrated embodiment of the invention, the high modulus reinforcement cords are aramid, the low modulus reinforcement cords are nylon and the high modulus reinforcement cords are disposed in a tire construction at an angle of ± 15 to $\pm 25°$ with respect to the equatorial plane (EP) of the tire and the low modulus reinforcement cords are aligned in the same general direction as the high modulus reinforcement cords and are disposed at an angle of ± 15 to $\pm 29°$ with respect to the EP of the tire.

Also provided is a method of building the tires of the invention, comprising the steps of reducing the diameter of a belt building drum below that required for assembly of a belt

reinforcement package (23) for a tire (10), applying a low modulus reinforcing material (19,19a,19b,19c) on the belt building drum, expanding the diameter of the belt building drum to a diameter which is still less than the diameter required for the tire, applying a high modulus reinforcing material (18) over the low modulus reinforcing material (19,19a,19b,19c) on the belt building drum, expanding the diameter of the belt building drum to the diameter required for the belt reinforcing package (23) of a tire, applying cut belts (17) over the high modulus reinforcing material (18) on the building drum, folding the high modulus reinforcing material (18) and the low modulus reinforcing material (19,19a,19b,19c) over the cut belts (17), expanding a tire carcass to the belt reinforcing package (23), and adding tread (16) and sidewalls (15) and any other external components required to complete the tire construction.

A method of building a belt package using the above steps is also provided.

Brief Description of Drawings

Fig. 1 illustrates a cross section of a tire of the invention.

Fig. 2 illustrates one embodiment of a belt of the tire encompassed by a low modulus reinforcement ply for reinforcing the crown area of the tire.

Fig. 3 illustrates an alternative reinforcement construction for the crown area of the tire.

Fig. 4 illustrates a second alternative construction for crown area reinforcement of the tire.

Detailed Description of the Invention

With reference to Fig. 1, in an illustrated embodiment, an aircraft tire (10) of the invention comprises a pair of parallel annular beads (12), carcass ply (13) wrapped around the beads, optional apex (22) above the bead and between the carcass ply and the carcass ply turnup, optional flipper (11) protecting the bead area, optional inner liner (14) radially inward of the carcass ply, reinforcement package (23) comprising folded belt (18) wrapped around cut belts (17) and low modulus reinforcement ply (19) wrapped around folded belt (18) disposed over carcass ply (13) in a crown area of the tire, tread (16) disposed radially above reinforcement package (23), and sidewalls (15) disposed between the tread and a bead area of the tire.

Those skilled in the art will recognize that aircraft tires are made with up to 4 pairs of beads and up to 12 carcass plies and up to 12 belt plies depending on their intended use.

Cut belts (17) and high modulus reinforcement material (18) comprise high modulus reinforcement cords embedded in rubber. Two to five cut belts can be used in the tire of the invention. In the illustrated embodiment, three cut belts having an end count of 14 to 22 e.p.i. are used. The ply used to form high modulus reinforcement material (18) also has an end count of 14

to 22 e.p.i.

The high modulus cords used in the invention may be, for example, aramid or steel, or any other high modulus material having similar properties, or a combination of such high modulus materials. Such reinforcement cords can comprise any suitable denier and any suitable twist. Such high modulus cords may be treated to increase their bond strength to rubber, and aramid reinforcement cords may be coated with an adhesive or an adhesive/epoxy combination. The high modulus cords used in the illustrated embodiment are 1500/3 denier aramid and have a twist of 6.9/6.9.

Those skilled in the art will recognize that in a folded ply construction, cord reinforcement in the folded over part of the ply will have an equal but opposite angle with respect to the EP of the tire as the non folded over portion of the ply. As used herein, the angle of reinforcement cords in a folded ply will be indicated with a plus/minus ($\pm$) in front of the angle. Angles of cords in other reinforcement plies in the tire will be given an absolute value, regardless of their general direction of orientation, it being understood that in most, but not all cut belt constructions, reinforcement cords in alternate cut belts are oriented in the opposite direction with respect to the EP of the tire. In the illustrated embodiment, the angle of the reinforcement cords in the cut belts 17 are at an angle of 12 to 22° with respect to the EP of the tire, and reinforcement cords in alternate cut belts have the opposite angle of orientation.

In the illustrated embodiment, aramid cords coated with an RFL adhesive and an end count of 20 e.p.i. were used, and the ply used to form high modulus reinforcement material (18) was incorporated into the tire wherein the reinforcement cords were oriented at an angle of $\pm$18° with respect to the EP of the tire. In the illustrated embodiment, the tire is a radial ply tire wherein the reinforcement cords in the cut belts (17) are oriented at an angle of 15° with respect to the EP of the tire.

Low modulus reinforcement material (19,19a,19b,19c) comprises low modulus reinforcement cords or filaments embedded in rubber and having an end count of 14 to 22 e.p.i.

Low modulus cords or filaments of, for example, nylon can be used in the construction of low modulus reinforcement material (19,19a,19b,19c). Such reinforcement cords can comprise any suitable size and twist, and in the illustrated embodiment, 840/2 denier nylon cords with a twist of 12/12 were used and incorporated in the ply at an end count of 21 e.p.i.

The angle of the low modulus reinforcement cords or filaments in the low modulus reinforcement material (19,19a,19b,19c) may be oriented in the tire having the same angle with

respect to EP as the high modulus reinforcement cords in high modulus reinforcement material (18) up to an angle 4° greater than such high modulus cords and, accordingly, may be angled at ±15 to ±29° with respect to the EP of the tire, and in the illustrated embodiment were oriented at the same angle as the reinforcement cords in high modulus reinforcement material (18).

Tires tested according to the invention were made using cable beads and a carcass construction comprising two turn-up plies and one turndown ply. It is believed that the belt package reinforcement described will work with any conventional aircraft tire construction.

For the purposes of this invention, the high modulus reinforcing material (18) and the low modulus reinforcing material (19,19a,19b,19c) is substantially two dimensional, those skilled in the art being aware that such plies are about 8 to 12 mm thick. For the tire in the illustrated embodiment, the full width of the ply used to form high modulus reinforcement material (18) is 9.8 inches and the width of the ply used to form low modulus reinforcing material (19,19a,19b,19c) is 10.1 inches, and the length of both plies is about 74 inches, it being understood that the length and width can vary depending on the size of the tire and the tire construction in which the described belt reinforcement package (23) is used.

The low modulus reinforcing material (19,19a,19b,19c) substantially covers the radially outermost surface and/or the radially innermost surface of the folded belt in addition to the folded belt edges of high modulus reinforcing material (18).

In various illustrated embodiments, low modulus reinforcing material (19) may be applied to fully encompass high modulus reinforcement material (18) (Fig. 2), to be placed in the tire radially below high modulus reinforcement material (18) wherein the ply ends (25) are folded around the folded ends (21) of high modulus reinforcement material (18) (Fig. 3), or provided in split layers wherein the ends 42 of low modulus reinforcement (19b,19c) radially below high modulus reinforcement material (18) cover the folded ends (21) of high modulus reinforcement material (18) and the distal ends (44) thereof are folded over high modulus reinforcement material (18) to fully encompass the radially outward portion thereof (Fig. 4). In general, the ply used to form low modulus reinforcing material (19,19a,19b,19c) may have the same width or about five-eighths to seven-eighths of the width of the ply used to form high modulus reinforcement material (18).

In building the tires of the invention, it has been found that the various ply used to make reinforcement package (23) tend to tangle and bunch if their actual length is not adjusted to reflect their actual relationship in the tire. For example, since the low modulus reinforcement material

(19,19a,19b,19c) is the radially innermost belt package ply in the tire, its actual diameter in a completed tire is slightly less than the diameter of the cut belts (17) which are disposed radially above the low modulus reinforcing material (19,19a,19b,19c), and if all the plies are the same length, the radially innermost ply bunches when the top layers are added or when the carcass is expanded to meet the belt package during the tire building procedure. Accordingly, the method of building the tires of the invention comprises the steps of, reducing the diameter of a belt building drum below that required for building a belt, applying a low modulus reinforcing material (19,19a,19b,19c) to the belt building drum, expanding the diameter of the belt building drum to a diameter which is still less than the diameter required for building a tire, applying a high modulus reinforcing material (18) over the low modulus reinforcing material (19,19a,19b,19c) on the belt building drum, expanding the diameter of the belt building drum to the diameter required for building a belt reinforcement package (23) for a tire, applying cut belts (17) over the high modulus reinforcing material (18) on the building drum, folding the high modulus reinforcing material (18) and the low modulus reinforcing material (19,19a,19b,19c) over the cut belts (17), expanding the tire carcass to the belt reinforcing package (23), and adding tread (16) and sidewalls (15) and any other external components required to complete the tire construction.

The belt reinforcing package (23) described herein may be useful in other types of tires and also provided is a method of building a belt package, said method comprising the steps for building a belt package described above.

Conventional tire building equipment may be used to carry out the method of the invention without modification. The tire construction is completed as is otherwise known in the art.

For purposes of illustration, a low modulus reinforcing material (19,19a,19b,19c) may have a length of about 73.5 inches, a ply for a folded belt comprising high modulus reinforcement (18) may have a length of about 74 inches, and the cut belts (17) may have a length of about 74.5 inches.

The low modulus reinforcement material (19,19a,19b,19c) and the high modulus reinforcing material (18) are folded at the same time in the tire building procedure, and when the low modulus reinforcement material (19,19a,19b,19c) and the high modulus reinforcing material (18) are the same width, a construction where a folded high modulus reinforcement material (18) is encapsulated by a low modulus reinforcing material (19) is formed as illustrated in Fig. 2. When the low modulus reinforcing material (19a) is not as wide as the high modulus reinforcing material (18), a construction similar to that illustrated in Fig. 3 is obtained using the same technique. To

form the construction illustrated in Fig. 4, two split layers of low modulus reinforcing material (19b,19c) are applied to the building drum wherein a first end 42 of low modulus reinforcing material (19b,19c) are applied to the drum followed by application of the high modulus reinforcing material (18) to the drum, and distal ends (44) of split high modulus reinforcement material (19b,19c) are folded at the same time as the high modulus reinforcing material (18) to form high modulus reinforcement material (18) and a reinforcement package including low modulus reinforcing material (19b,19c).

In the embodiment illustrated in Fig. 3, the ply used as the low modulus reinforcement material (19a) is about three-fourths as wide as the ply used to form high modulus reinforcement material (18). In Fig. 4, the combined width of low modulus reinforcement material (19b,19c) is about three-fourths of the width of the ply used to form high modulus reinforcement material (18).

As illustrated in Fig. 2, it is preferred that the folded ends (27) of the ply used to form high modulus reinforcement material (18) and ply ends (25) of low modulus reinforcement material (19,19a,19b,19c) be in abutment at the EP of the tire, but those skilled in the art will recognize that the ends (27) of the high modulus reinforcing material (18) and ends (25) of the low modulus reinforcing material (19,19a,19b,19c) can be off-set from the EP of the tire, and in some applications, the high modulus reinforcing material (18) ends (27) and low modulus reinforcing material (19,19a,19b,19c) ends (25) may be short of abutment or may form an overlap splice.

Aircraft tires of the kind illustrated herein are qualified by a step load test where tires at a specific load are run at various increasing speed steps up to a maximum, and under an increased load are run through the speed steps again. A tire qualifies if it finishes intact 61 cycles of this test at the designated loads and speeds.

Tires of the invention have been preliminarily qualified at speeds of 210 mph in a radial aircraft tire size 26x6.6R14 14PR, and it is believed that such tires will qualify at 225 mph. It is believed also that retreadability will be increased substantially. It has been shown that tires of the invention show increased tread wear as compared to similarly constructed tires using nylon belt reinforcement.

While the invention has been variously illustrated and described, those skilled in the art will recognize that the invention may be variously modified and practiced. The scope of the invention is limited only by the following claims.

CLAIMS

1. An aircraft tire (10) comprising at least one pair of parallel annular beads (12), at least one carcass ply (13) wrapped around said beads (12), a belt reinforcement package (23) disposed over said at least one carcass ply (13) in a crown area of said tire (10), tread (16) disposed over said belt reinforcement package (23), and sidewalls (15) disposed between said tread (16) and said beads (12), said tire being characterized by a belt reinforcement package (23) comprising a layer of low modulus reinforcement material (19,19a,19b,19c) wrapped around folded edges of a high modulus reinforcement material (18).

2. The aircraft tire of claim 1 wherein said high modulus reinforcement material (18) has a width about twice the width of said belt reinforcement package (23).

3. The aircraft tire of claim 2 wherein said low modulus reinforcement material (19) has substantially the same width as said high modulus reinforcement material (18) and is folded completely around said high modulus reinforcement material (18).

4. The aircraft tire of claim 2 wherein said low modulus reinforcement material (19a) has a width about five-eighths to seven eighths of the width of said high modulus reinforcement material (18) and is placed radially below said high modulus reinforcement material (18) and the edges of said low modulus reinforcement material (19a) are folded radially above said high modulus reinforcement material (18).

5. The aircraft tire of claim 2 wherein said low modulus reinforcement material (19b,19c) comprises split belt edge layers having a combined width of about five-eighths to seven eighths of the width of said high modulus reinforcement material (18) wherein one edge of each split layer is disposed radially below said high modulus reinforcement material (18) and the distal end of each split layer is folded radially above the high modulus reinforcement material (18) substantially completely covering the radially outer surface of said high modulus reinforcement material (18).

6. The aircraft tire of claim 1 wherein said high modulus reinforcement material (18) is aramid.

7. The aircraft tire of claim 1 wherein said low modulus reinforcement material (19,19a,19b,19c) is nylon.

8. The aircraft tire of claim 1 wherein said high modulus reinforcement material (18) is disposed in a tire construction at an angle of ± 15 to $\pm 25°$ with respect to the equatorial plane (EP) of the tire and said low modulus reinforcement material (19,19a,19b,19c) is aligned in the same general direction as said high modulus reinforcement material (18) and is disposed at an angle of

±15 to ±29° with respect to the EP of the tire.

9. A method of building an aircraft tire comprising the steps of

(a) reducing the diameter of a belt building drum below that required for building a belt reinforcing package (23) for a tire (10),

(b) applying a low modulus reinforcement material (19,19a,19b,19c) to said belt building drum,

(c) expanding the diameter of said belt building drum to a diameter which is still less that the diameter required for building a belt reinforcing package (23) for a tire (10),

(d) applying a high modulus reinforcement material (18) over said low modulus reinforcement material (19,19a,19b,19c) on said belt building drum,

(e) expanding the diameter of said belt building drum to the diameter required for building a belt reinforcing package (23) for a tire (10),

(f) applying cut belts (17) over said high modulus reinforcement material (18),

(g) folding the high modulus reinforcement material (18) and the low modulus reinforcement material (19,19a,19b,19c) over said cut belts (17) to form a belt reinforcing package (23),

(h) expanding a tire carcass on a tire building drum to the belt reinforcing package (23), and

(i) adding tread (16) and sidewalls (15) and any other external components required to complete the construction.

10. A method of building a belt package for a pneumatic tire comprising the sequential steps of

(a) reducing the diameter of a belt building drum below that required for building a belt reinforcing package (23) for a tire (10),

(b) applying a low modulus reinforcement material (19,19a,19b,19c) to said belt building drum,

(c) expanding the diameter of said belt building drum to a diameter which is still less that the diameter required for building a belt reinforcing package (23) for a tire (10),

(d) applying a high modulus reinforcement material (18) over said low modulus reinforcement material (19,19a,19b,19c) on said belt building drum,

(e) expanding the diameter of said belt building drum to the diameter required for building a belt reinforcing package (23) for a tire (10),

(f) applying cut belts (17) over said high modulus reinforcement material (18),

(g) folding the high modulus reinforcement material (18) and the low modulus reinforcement material (19,19a,19b,19c) over said cut belts (17).

ABSTRACT

An aircraft tire having a high modulus reinforcement material (18) construction and a low modulus reinforcement material (19,19a,19b,19c) over the high modulus reinforcement material (18) construction has improved high-speed properties. The low modulus reinforcement material (19,19a,19b,19c) substantially covers the top surface and/or the bottom surface of the high modulus reinforcement material (18) in addition to the high modulus reinforcement material (18) edges. The high modulus reinforcement material (18) construction is reinforced with high modulus materials, and the low modulus reinforcement material (19,19a,19b,19c) is reinforced with low modulus materials. In a method of the invention, plies which make up the belt reinforcement package are applied to a belt building drum while the building drum is at different diameters to minimize stresses on the belt package. In a method of building a tire of the invention, a tire carcass on a tire building drum is expanded to the belt package.

Docket No. DN1996221

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **AIRCRAFT TIRE WITH IMPROVED HIGH SPEED PROPERTIES** the specification of which (check one)

__X__ is attached hereto.

_____ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s) or §365 of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose material information as defined in 37 C.F.R. §1.56 which become between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status)(patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status)(patented, pending, abandoned)

POWER OF ATTORNEY

As named inventor(s), I or we hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

David E Wheeler	Registration No. 29,726
Robert W Brown	Registration No. 24,499
Thomas P Lewandowski	Registration No. 26,478
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(4)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statement may jeopardize the validity of the application or any patent issuing thereon.

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☐ Additional inventors are being named on separately numbered sheets attached hereto.

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